

[0018] Like reference symbols in the various drawings indicate like elements.

DETAILED DESCRIPTION

[0019] FIG. 1A shows a top view of a floating data center system 100 using wave-power. In general, the system 100 has a floating platform and an array of wave-powered generators. The wave-powered generators 106, 110 may be implemented, for example, in the form of Pelamis machines, as discussed in more detail below. The floating platform 102 carries one or more modules of a modular data center 104, which may be powered from electricity produced by the motion of the wave-powered generators 106, and may be cooled by cooling water pumped by the wave-powered generators 110. As a result, the data center modules may operate without being connected to external utilities.

[0020] Such an arrangement may beneficially permit for more ready deployment of data centers to areas in particular need of computing or telecommunications power. The data centers may be quickly and inexpensively constructed on land, such as in modular units, including standard shipping containers. They may then be hauled, as shipping containers, on trucks to the seaside, and may then be lifted in conventional manner onto a ship. Once on the ship, they may be connected to electrical and cooling services already on the ship, and the ship may deploy to an area in need of assistance. The ship may then anchor in an area offshore where wave or tidal motion is sufficiently strong or large so as to permit electrical generation and pumping power. In addition, old modules may be easily replaced with newer modules, as new technologies develop or as old units quickly wear out under adverse sea conditions. Moreover, by using standard shipping containers whose transportation is well known to most dock workers and seamen, the system 100 may be more readily transported and implemented without significant or specialized training.

[0021] A floating platform 102, such as a cargo ship, may carry one or more modular data centers 104. For example, a freighter may have a data center contained in inter-modal freight containers. Existing mechanisms, such as port facilities, may be used to handle the containers. The platform 102 provides power and cooling capacity to the modular data centers 104, in addition to supporting the modular data centers 104. The modular data centers 104 may be arranged in a two-dimensional or three-dimensional grid. For example, as shown in the figure, two rows that each contain two containers are shown. Those modules could also be stacked two or more high, so that the platform 102 holds eight or twelve or more modules.

[0022] Support systems may be provided in the floating platform 102, such as for power and cooling of the modular data centers 104. For example, diesel powered electrical generators may be provided below decks to supply supplemental electrical power such as when high data loads are seen or when the motion-powered machines 106, 110 are otherwise not providing sufficient electricity. Also, pumps and other mechanical components may be provided upon the floating platform 102, and connections between the components and the modular data centers 104 may be provided. The connections may include connectors that terminate on the platform deck near where the data centers 104 are to be located, so that quick-connect connections may be made when the data centers 104 are dropped into location.

[0023] Motion-powered machines 106, 110 may provide power and cooling capacity for the platform 102. Motion-powered machines 106, 110 can harness wave energy from a body of water such as the sea or a river, and convert it to a useful form, such as a mechanical motion for powering an electrical generator or for turning or otherwise operating a water pump. One advantage of such a system is that the energy collected from the water is essentially free and non-polluting.

[0024] As shown in FIG. 1A, the motion-powered machines 106, 110 are arrayed into two groups, and are formed of multiple Pelamis machines that are described below. Machines 106 are an array of machines for electrical generation, and are tethered and electrically wired to platform 102. Machines 110 are a pair of machines for pumping of water that is around the platform 102 onto the platform. For example, machines 106 may each create a pumping action that pulls water from their immediate vicinity and pumps it onto the platform 102 through an appropriate conduit.

[0025] In general, motion-powered machines 106, 110 may be made up of multiple pontoon segments 106A-D, that are movable relative to each other. One exemplary system is the Pelamis P-750 Wave Energy Converter. The pontoons may take any appropriate size, but may each be on the order of 3.5 meters in diameter 150 meters long. Each machine can generate approximately 750 kilowatts, and an array or farm of machines can produce 2.25 megawatts or more. Approximately 40 machines spread over a square kilometer could also produce approximately 30 MW. The system 100 may operate satisfactorily, for example, approximately 3-7 miles from shore, in 50-70 meters of water.

[0026] The pontoons 106A-D are connected end-to-end in a manner (e.g., using joints) that allows them to pivot relative to each other, such as with hinges that allow the motion-powered machines 106, 110 to flex at the pontoon joints. Each individual segment of a machine 106, 110 is connected to the next-adjacent segment with hydraulic cylinders next to the hinges or pivots. For example, each hydraulic piston may be connected to a first pontoon 106A and a second pontoon 106B.

[0027] As one pontoon segment pivots relative to another, a hydraulic piston or ram may move into one of the segments to force high pressure oil through hydraulic motors in the segment. The force of the rams may be evened out using hydraulic accumulators attached to the motors, which may operate at, for example, 1500 rpm. The hydraulic motors may in turn be connected via a drive shaft with one or more sealed electrical generators. In sum, relative pivoting of the segments causes the ram to force fluid through the motors, and in turn causes the electrical generators to turn and make electricity. Alternatively, the machines 106, 110 may power water pumps in a similar manner.

[0028] The motion-powered machines 106, 110 may be held in place by mooring lines attached to anchors 108. As waves encounter the pontoons, the pontoons may move up or down, bending at the joints to remain at the surface of the waves. Electricity produced by the generators on motion-powered machines 106, 110 may be passed via a conductor, such as a cable, to the floating platform 102.

[0029] Electrical power received from the motion-powered machines 106, 110 may be converted to an appropriate form for powering datacenters on the ship. For example, the power may be rectified to produce DC power that may be used directly by computers in modular data centers 104. The gen-